What is claimed is:

1. A system, comprising:

a transmitter configured to transmit a signal, the transmitter including

a 2^P-state QAM submodulator configured to receive an original data stream and to produce an encoded data stream of symbols,

a M-ary frequency shift keying modulator configured to receive the encoded data stream and to modulate each symbol as a P-length sequence of tones, each tone of the P-length sequence having a frequency corresponding to one of M frequencies, and each unique P-length sequence of tones corresponding to a respective unique symbol, and

a mechanism for transmitting each of the P-length sequences of tones as the signal; and

a receiver configured to receive the signal and to incoherently demodulate the signal to recover the original data stream, the receiver including

a M-ary frequency shift keying demodulator configured to receive the signal and to demodulate the signal to produce a demodulated sequence of tones, each tone corresponding to one of the M frequencies, and

a 2^P-state QAM subdemodulator configured to receive the demodulated sequence of tones, to correlate the demodulated sequence of tones into the encoded data stream of symbols, and to decode the encoded data stream of symbols to produce the original data stream.

2. The system of Claim 1, wherein:

M is equal to $(2^{P-1}-1)$.

3. The system of Claim 1, wherein:

M is selected such that each unique P-length sequence of tones has zero frequency bias such that the modulator has no DC frequency response.

4. The system of Claim 1, wherein:

the M-ary frequency shift keying demodulator is configured to have a peak deviation such that the system has a bit error rate for a particular carrier to noise ratio at the receiver, the bit error rate being equal to another bit error rate corresponding to the carrier to noise ratio for a coherent 2^P-level frequency shift keying system.

5. The system of Claim 1, wherein:

the 2^P-state QAM subdemodulator comprises a correlator having no DC response.

6. The system of Claim 1, wherein:

M and P are selected such that the DC component is removed from the encoded data stream of symbols without reducing a bit rate of the original data stream.

7. The system of Claim 1, wherein:

the demodulated sequence of tones produced by the M-ary frequency shift keying demodulator comprises a modulation domain signal, and

the receiver further includes a trip detection mechanism including

a 2^P-state QAM trip correlator configured to receive the modulation domain signal and produce an in-phase (I) data signal and a quadrature (Q) data signal, the I data signal and the Q data signal having a symbol rate;

an averager configured to receive the I data signal and the Q data signal and to produce an averaged I data signal and an averaged Q data signal;

a Cartesian-to-polar converter configured to receive the averaged I data signal and the averaged Q data signal and to produce a first signal containing magnitude information and a second signal containing angle information;

a first delay configured to receive the first signal containing magnitude information and to produce a delayed first signal, the delayed first signal being delayed by one symbol relative to the first signal;

a second delay configured to receive the second signal containing angle information and to produce a delayed second signal, the delayed second signal being delayed by one symbol relative to the second signal;

a first comparator configured to receive the first signal and the delayed first signal and to produce a first output signal, the first output signal having

a true value if an absolute value of a difference between the first signal and the delayed first signal is less than a first predetermined threshold, and

a false value otherwise;

a second comparator configured to receive the second signal and the delayed second signal and to produce a second output signal, the second output signal having

a true value if an absolute value of a difference between the second signal and the delayed second signal is less than a second predetermined threshold, and

a false value otherwise; and

an AND gate configured to receive the first output signal and the second output signal and to produce a third output signal containing trip detection information, the third output signal having

a true value indicating a positive trip detection if both the first output signal and the second output signal have a true value, and

a false value indicating a false trip detection otherwise.

8. The system of Claim 1, wherein the receiver further includes:

a synchronization mechanism configured to orient a QAM constellation and frame symbols of a data stream for subsequent demodulation,

wherein the QAM constellation is gray encoded to enable 1-bit error correction.

9. A cellular network comprising:

a plurality of first nodes configured to transmit a first data packet on a predetermined frequency;

a first base station configured to receive signals transmitted on the predetermined frequency;

a second base station locationally dispersed from the first base station and configured to receive signals transmitted on the predetermined frequency; and

a data concentrator, wherein

the plurality of first nodes are configured to transmit using a duty cycle of less than 0.1% and to transmit a unique identification parameter,

the first base station and the second base station are arranged in a configuration such that a first coverage area of the first base station at least partially overlaps a second coverage area of the second base station,

the first base station and the second base station each receive the first data packet transmitted by at least one of the plurality of first nodes, and

the data concentrator is configured to collect the first data packet received by the first base station and the first data packet received by the second base station.

10. The network of Claim 9, wherein each of the plurality of first nodes is a transceiver, comprising:

a first mechanism configured to transmit a first signal including an encoded and modulated first original data stream, the first mechanism having

a 2^P-state QAM submodulator configured to receive an original data stream and to produce an encoded data stream of symbols,

a M-ary frequency shift keying modulator configured to receive the encoded data stream and to modulate each symbol as a P-length sequence of tones, each tone of the P-length sequence having a frequency corresponding to one of M frequencies, and each unique P-length sequence of tones corresponding to a respective unique symbol, and

a mechanism for transmitting each of the P-length sequences of tones as the first signal; and

a second mechanism configured to receive a second signal including an encoded and modulated second original data stream, the second mechanism being configured to incoherently demodulate the second signal and having

a M-ary frequency shift keying demodulator configured to receive the second signal and to demodulate the second signal to produce a demodulated sequence of tones, each tone corresponding to one of the M frequencies, and

a 2^P-state QAM subdemodulator configured to receive the demodulated sequence of tones, to correlate the demodulated sequence of tones into an encoded data stream of symbols, and to decode the encoded data stream of symbols to produce the second original data stream.

11. The network of Claim 9, wherein:

the plurality of first nodes are configured to transmit a first data packet on a predetermined frequency using a transmitter configured to transmit a frequency shift keying modulated signal having an imprecise modulation deviation, the signal including a short leader including a constant repeating symbol pattern, and

the first and second base stations are each configured to receive signals transmitted on the predetermined frequency using a receiver, including

a signal demodulator configured to convert the signal to a modulation domain signal, and

a post detection theta-r trip detection mechanism configured to detect an acquisition of the short leader included in the modulation domain signal.

12. The network of Claim 9, wherein:

the plurality of first nodes are further configured to transmit at a plurality of preset frequencies, the predetermined frequency being one of the plurality of preset frequencies,

the first base station and the second base station are further configured to receive at the plurality of preset frequencies, and

each of the preset frequencies is a narrowband frequency channels.

13. The network of Claim 9, wherein:

the plurality of first nodes do not include a power control mechanism configured to adjust a transmission output power in response to a near/far problem.

14. The network of Claim 9, further comprising:

a second node configured to transmit a second data packet on a second predetermined frequency, wherein

the first base station and the second base station are further configured to receive signals on the second predetermined frequency,

the first base station and the second base station each receive the second data packet transmitted by the second node,

the predetermined frequency and the second predetermined frequency are on adjacent channels,

a first received signal level at the first base station is uncorrelated with a second received signal level at the second base station,

the first base station receives the first data packet on the predetermined frequency at a first strong signal level and the second data packet on the second predetermined frequency at a first weak signal level,

the second base station receives the first data packet on the predetermined frequency at a second weak signal level and the second data packet on the second predetermined frequency at a second strong signal level, and

the data concentrator is further configured to overcome the effects of channel roll off to adjacent channels by collecting the first data packet successfully received by the first base station and the second data packet successfully received by the second base station.

15. The network of Claim 9, wherein:

the first base station and the second base station are further configured to abort signals received with poor signal quality.

16. The network of Claim 9, wherein:

the first data packet includes a message identification field,

the plurality of first nodes are further configured to re-transmit the first data packet at least one time after a delay between transmissions, and

the data concentrator is further configured to collect a first copy of the first data packet from the first base station and a second copy of the first data packet from the first base station and to eliminate one of the first copy of the first data packet and the second copy of the first data packet as a redundant message based on a value of the message identification field.

17. The network of Claim 9, wherein:

the plurality of first nodes are further configured to redundantly retransmit the first data packet M times at a time interval of $1/\lambda$;

each of the plurality of first nodes is one of N nodes, each of the N nodes being within a coverage area of a base station;

the first base station and the second base station are two of B base stations, the B base stations having a coverage area such that each of the B base stations receive the first data packet from at least one of the plurality of first nodes, and

a system probability of successful reception of the first data packet satisfies an ALOHA equation

$$P_s = 1 - [1 - e^{-\lambda NT}]^{MB}, \text{ where}$$

P_s is a probability of a successful reception at one of the B base stations, and

T is a time duration of the first data packet.

18. The network of Claim 9, wherein:

the plurality of first nodes are further configured to enter a low power mode after transmitting the first data packet and until another data packet is transmitted,

the plurality of first nodes are further configured to leave the low power mode in response to at least one of a timer and an external event, and

the plurality of first nodes are further configured to respond to the at least one of a timer and an external event by

enabling a frequency determining crystal,

placing a microprocessor into a run state,

causing the microprocessor to format a data packet,

transmitting a synchronization leader,

transmitting a plurality of identification bits corresponding to at least one of the plurality of first nodes,

transmitting a plurality of data bits,

transmitting a plurality of error detection bits, and

causing the low power state to be re-entered.

19. The network of Claim 9, wherein

the plurality of first nodes are further configured to transmit a message including a sequence of data packets on the predetermined frequency, each of the data packets including a sequence number identifier corresponding to a position of the data packet in the sequence,

the first base station and the second base station are further configured to receive the message transmitted by at least one of the plurality of first nodes,

the data concentrator is further configured to collect the message received by the first base station and the second base station,

each of the data packet further includes a historic data field including data from an earlier transmission of at least one of the plurality of first nodes, and

the data concentrator is further configured to determine when a data packet has not been received based on the sequence number identifier and to collect missing data from the historic data field of a subsequently collected data packet.

20. The network of Claim 9, wherein:

the plurality of first nodes are further configured to transmit at one of

a normal mode having a normal baud at the predetermined frequency, and

a boost mode having a boost baud at a boost frequency,

the boost baud being lower than the normal baud, and the boost frequency being different than the predetermined frequency.

21. The network of Claim 9, further having a method for increasing channel capacity, comprising:

transmitting at a predetermined frequency, by at least one of the plurality of first nodes within a coverage area of at least one of the first base station and the second base station, a message of length T, M times at an interval of $1/\lambda$;

receiving, by at least one of the first base station and the second base station, the message with a probability of success satisfying the ALOHA equation

$$P_s = 1 - [1 - e^{-(2\lambda NT/P)}]^M,$$ where

P_s is a probability of a successful reception by at least one of the first base station and the second base station, and

P is a ratio of a signal bandwidth to an available system bandwidth, wherein

the predetermined frequency is one of a plurality of adjacent frequency channels, and

frequency guard bands between the plurality of adjacent frequency channels are not allocated.

22. The network of Claim 9, further comprising:

a bi-directional bridge configured to connect the network to another network,

wherein the bi-directional bridge is further configured to at least one of

re-transmit a first message received from the network to the another network immediately upon reception of the first message and

re-transmit a second message received from the another network to the network immediately upon reception of the second message.

23. The network of Claim 9, wherein:

the predetermined frequency is one of a plurality of narrowband frequency channels, and the first base station and the second base station each having a mechanism for evaluating the plurality of narrowband frequency channels and selecting an optimum channel of the plurality of narrowband frequency channels for use in detecting a signal, comprising:

a channel filter bank configured to receive an input signal and produce a channel bank having at least two channelized outputs, each of the at least two channelized outputs having a reduced bandwidth relative to the input signal and corresponding to a different center frequency;

a downconverter configured to downconvert the channel bank to baseband;

a magnitude determination mechanism configured to determine a magnitude for each of the at least two channelized outputs;

a selection mechanism configured to select one of the at least two channelized outputs having a largest magnitude as determined by the magnitude determination mechanism and to output an index corresponding to the selected one of the at least two channelized outputs;

an averaging mechanism configured to average the index output by the selection mechanism with at least one additional index subsequently output by the selection mechanism to produce an averaged channel index;

a rounding mechanism configured to round the averaged channel index to a nearest channel index and output a rounded channel index; and

a multiplexing mechanism configured to pass one of the at least two channelized outputs as a passed channel based on the rounded channel index.

24. The network of Claim 9, wherein:

the predetermined frequency is one of a plurality of narrowband frequency channels, and the first base station and the second base station each having a mechanism for evaluating the plurality of narrowband frequency channels and selecting an optimum channel of the plurality of narrowband frequency channels for use in detecting a signal, comprising:

a channel filter bank configured to receive an input signal and produce a channel bank having at least three channelized outputs, each of the at least three channelized outputs having a reduced bandwidth relative to the input signal and corresponding to a different center frequency;

a downconverter configured to downconvert the channel bank to baseband;

a magnitude determination mechanism configured to determine a magnitude for each of the at least three channelized outputs;

a selection mechanism configured to select one of the at least three channelized outputs having a largest magnitude as determined by the magnitude determination mechanism and to output an index corresponding to the selected one of the at least three channelized outputs;

an averaging mechanism configured to average the index output by the selection mechanism with at least one additional index subsequently output by the selection mechanism to produce an averaged channel index;

a rounding mechanism configured to round the averaged channel index to a nearest channel index and output a rounded channel index;

a multi-channel multiplexing mechanism configured to pass at least three of the at least three channelized outputs as at least three passed channels, the at least three passed channels being adjacent to one another and centered in frequency based on the rounded channel index;

a multi-channel FM demodulation mechanism configured to receive and FM demodulate each of the at least three passed channels and output at least three modulation domain channels corresponding to the at least three passed channels;

a multi-channel averaging mechanism configured to average the at least three modulation domain channels with at least one additional set of at least three modulation domain channels subsequently output by the multi-channel FM demodulation mechanism to produce at least three averaged modulation domain channels corresponding to the at least three modulation domain channels;

a second selection mechanism configured to select one of the at least three averaged modulation domain channels having a minimum frequency error and to output a second index corresponding to the selected one of the at least three averaged modulation domain outputs;

a multiplexing mechanism configured to pass one of the at least three channelized outputs as a passed channel based on the second index, wherein

the passed channel is provided for at least one of signal detection and signal acquisition.

25. The network of Claim 9, wherein:

the first and second base station receiver includes

a downconverter configured to convert the signal to an intermediate frequency signal,

a bandpass filter configured to have a center frequency equal to a frequency of the intermediate frequency signal, to receive the intermediate frequency signal and to bandpass filter the intermediate frequency signal, and to output a filtered intermediate frequency signal,

a gain configured to establish noise floor and signal sensitivity,

a FM demodulator configured to receive the filtered intermediate frequency signal and to output a modulation domain signal,

a digitizer configured to receive the modulation domain signal and to output a digitized modulation domain signal, and

a delay configured to receive the digitized modulation domain signal and output a delayed modulation domain signal based on an input control; and

the subdemodulator includes

a QAM correlator configured to receive and translate the delayed modulation domain signal into a correlation quadrature output signal,

a theta-r trip determination mechanism configured to receive the correlation quadrature output signal and to output a trip indication signal during a leader portion of a received message,

a bit timing alignment and deviation determination mechanism configured to receive the trip indication signal and output the input control and at least one data decision threshold, and

a data demodulator configured to receive the correlation quadrature output signal, decode the received message, and output a decoded data stream corresponding to the original data stream.

26. The network of Claim 25, wherein the QAM correlator is further configured for removing frequency uncertainty from a received signal comprising:

FM demodulating the received signal using a FM demodulator configured to be sufficiently linear over a system frequency uncertainty;

QAM subdemodulating a modulation domain signal from the FM demodulating step using a QAM subdemodulator configured to have no DC response.

27. The network of Claim 9, wherein:

the plurality of first nodes are further configured to be frequency agile such that the predetermined frequency comprises one of a plurality of frequencies,

at least one of the first base station and the second base station is further configured to receive each of the plurality of frequencies such that a number of nodes receivable by the at least one of the first base station and the second base station increases by a factor of πr^2, and

r is a communication range of the nodes.

28. The network of Claim 9, wherein:

the plurality of first nodes are configured to redundantly transmit a data payload by transmitting at least a portion of the data payload a plurality of times separated by a time interval.

29. The network of Claim 9, wherein:

the plurality of first nodes are configured to redundantly transmit a data payload by transmitting at least a portion of a previously transmitted data payload in the data payload.

30. The network of Claim 9, wherein:

the plurality of first nodes are configured to redundantly transmit a data payload by transmitting a plurality of at least a portion of previously transmitted data payloads in the data payload.

31. A system, comprising:

a plurality of receiver systems; and

a multifrequency transmitter having a Global Positioning System receiver,

wherein the multifrequency transmitter is configured to communicate with the plurality of receiver systems and to receive a present location from a Global Positioning System satellite, and to transmit on a first predetermined frequency when the present location is within a first predetermined geographic area, and on a second predetermined frequency when the present location is within a second predetermined geographic area.